Military officials and industry representatives came together at AUSA's Winter Symposium to discuss technology options for the Army of the future.
Heike Hasenauer

Reaching the army vision

SSG John Valceanu

Story by Heike Hasenauer

WHAT we're doing now is almost unthinkable," Army Chief of Staff GEN Eric K. Shinseki told hundreds of military leaders and industry executives gathered at the Broward County Convention Center in Fort Lauderdale, Fla., for the Association of the United States Army's winter symposium.

"Most opportunities for change are forced by war as adjustments are made to battle formations," he said. "Changing in peacetime, during a narrow window of opportunity, entails risk, but promises great rewards."

Army leaders hope to have the first of the two restructured brigades at Fort Lewis, Wash., operational by the end of December 2001.

Shinseki referred to the now highly publicized Army vision for the new millennium that he and Army Secretary Louis Caldera unveiled at the AUSA convention in Washington, D.C., in October.

The vision focuses on people and readiness, and on investing in brigade combat teams that will provide an interim capability for more rapid deployment of Army forces, Shinseki said.

Commanders attending the winter convention continued to elaborate on terms such as "transformation," "interim brigades" and "objective force," which since October have moved to the forefront of daily official

The number of new vehicles to be assigned to the interim brigades — and whether they would be wheeled or tracked — was also a significant topic of discussion for military and civilian leaders attending the AUSA symposium.

business and increasingly crept into casual conversation.

The words propelled military officials into high gear, piqued the interest of corporate leaders worldwide and, to some extent, shook up elements inside and outside the Defense Department that are concerned about the changes that are coming.

The Army vision, after all, refers to what Shinseki has called "the largest transformation in a century, integrating the capabilities of air, land, sea and space."

Much discussion focused on technologies for use by the "objective force" of about 2008 to 2010. As at the AUSA convention in October, technology displays lured attendees to take a closer look at the broad range of possibilities for the future Army *[see related story]*.

"The momentum you see here is a manifestation of what Shinseki has said about rolling up our shirt sleeves and making changes," said AUSA president and former Army chief of staff retired GEN Gordon R. Sullivan.

Recent tests at Fort Knox, Ky. focused on the "platforms" that will carry the lighter, more agile force into combat, Shinseki said. "Now we need to see what we have to add to the platforms to give us the range of capabilities we need."

While the Army will continue to incorporate digitization, it will consider other systems as well. "We have only one system now that can withstand a direct hit by an RPG-7 antitank rocket. That's the M1 main battle tank," Shinseki said.

"You have to balance what you want with the capabilities you'll have once you get to the battlefield," said Shinseki. The task force that went into Bosnia, for example, was built around Bradley fighting vehicles that had to be refueled twice daily. That posed a problem.

Uncertainty, even skepticism, can be created by talking about changing the Army, Shinseki continued. "My purpose is to allay skepticism. My message here is twofold: to tell you that the Army has moved up, and that

SSG John Valceanu

we must enhance our partnership with industry or we'll lose momentum."

In "moving up," he referred to advances since his October announcement. In January, Defense Department officials approved the Operational Readiness Directive that gave Army planners the go-ahead to create changes. Requests for proposals for platforms for the new interim combat infantry brigades went out in March. And Shinseki said a contract would probably be awarded some time this summer.

"Those platforms will give us infantry, mobile gun, and command-and-control capabilities, the functional capabilities we have today, only newly packaged," he said.

Shinseki hopes to have the first of the two restructured brigades at Fort Lewis, Wash., operational by the end of December 2001. Soldiers in the 3rd Brigade, 2nd Infantry Division, and 1st Bde., 25th Inf. Div., at Fort Lewis have already begun training with leased medium-armored vehicles.

"It's not what the interim systems will be, but we're not going to wait until 2001 to begin training," Shinseki said.

Shinseki estimated the cost of developing and integrating the new brigades would be $3 billion annually.

A technology leader, the Army Materiel Command, together with the Defense Advanced Research Projects Agency, and others, will be among the top players in the research-and-development effort. DARPA alone will contribute roughly $500 million annually for the next five years toward technology research, he said.

"I appreciate all of you coming here for one overarching good — the strength of our Army and the defense of our country," said GEN John G. Coburn, AMC's commander. "Information exchanges among the active and reserve components, and corporate America, will ensure we continue to have the strongest, best-equipped Army on earth."

"We're raising great youngsters who have great skills," Shinseki concluded. They'll have no trouble adjusting to changes within the Army, "because they will remain the centerpiece of our Army, and their leadership will remain our stock in trade as it has for 225 years." □

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Heike Hasenauer

A virtual-reality chamber at the AUSA symposium allowed visitors to don 3-D glasses and "crawl in and under" vehicles to see how the technology could be used in the future to make jobs such as vehicle maintenance easier.

AUSA

Technologies fo

Story by Heike Hasenauer

A FORM-fitting, "Spiderman"-type suit. A "minefield" composed of sensors and cameras, but no explosives. And batteries made of paper.

They're a few of the potential technologies exhibited at the recent Association of the U.S. Army winter symposium in Fort Lauderdale, Fla.

Some of the technologies have recently been incorporated into Army systems and have been fielded. Others are concepts undergoing further study and could be fielded from about 2008 to 2025.

or the Future

Land Warrior

U.S. Army Soldier Systems Center

PM-Soldier, a Fort Belvoir, Va., component of the U.S. Army Soldier Systems Center, displayed mannequins representing the evolution of the Land Warrior system that's now 25 pounds lighter and about $80,000 cheaper per unit than the initial version, said COL Bruce Jette, project manager for PM-Soldier.

Land Warrior is a first-generation, modular fighting system for individual infantrymen. It is composed of six integrated subsystems that include clothing and equipment needed to enhance soldier lethality, survivability, mobility and target acquisition capabilities.

The cost reduction is largely due to development of a much more compact, commercial communication and computer system, Jette said. His agency has done much of the work on Land Warrior, with support from the U.S. Army Communications-Electronics Command Research, Development and Engineering Center's Night Vision and Electronic Sensors Directorate.

The design would have cost $90,000 each for LW, Jette said. "We're down to $10,000 to $15,000 in estimated production cost per unit now."

While cost savings can be attributed largely to dramatic changes in technology, an increase in the number of companies capable of producing a particular product can also be credited. Jette said the LW system's first computer cost $32,000 and was available from only one vendor. The computer now costs $440 and is available from about 12 vendors.

Additionally, what Jette called "fire wire" will replace bulky cables. The old cables cost roughly $5,000 per unit. The wire, which will be bought commercially, will be more flexible and durable and will cost less than $100 per unit. LW also boasts a new, lighter-weight helmet, called MICH, that's currently used by special-operations forces.

LW, with its heads-up data display, will allow infantrymen to call up maps, send messages and request fire support, all by clicking a mouse, said Jette. Video and thermal image capability connected to their M-4 carbines will allow them to "see" and shoot around corners.

The first operational test of the LW system will be conducted in September with a platoon of the 82nd Airborne Division at Fort Bragg, N.C., said SGT Jeffery Catherell, a Fort Benning, Ga., soldier with the U.S. Army Training and Doctrine Command's Systems Manager-Soldier office who donned some of the LW equipment.

The target date for fielding the final version of the LW System — "an even more advanced model, smaller and more affordable than what was shown at AUSA" — is 2004, Jette said.

Ground-Proximity Warning System

This state-of-the-art navigational-aid system for pilots constantly monitors an aircraft's position relative to the terrain, said Cubic Defense Systems president Bruce Roberts. The Navy has used the system for several years.

Recent improvements to the system allow it to be integrated into existing avionics, Roberts said. Several years ago, that wasn't the case.

"What the Navy uses is a 17-pound system," Roberts continued. "The system's evolved to an algorithm on a chip. And from an initial cost of $100,000 per unit, it's down to about $5,000."

CPT Lawrence O. Basha

Force XXI Battle Command Brigade-and-Below System

A new, vehicular command-and-control system, it uses GPS to tell soldiers where they are and displays that information on a computer, indicating the position in relation to that of everyone else on the battlefield. It will be fielded to heavy divisions and the brigade combat teams, said CECOM commander MG Robert Nabors.

The system, currently being fielded to the first digitized division, the 4th Infantry Div. at Fort Hood, Texas, takes all data from various sources on the battlefield — from air defenders, field artillery, combat service support, intelligence and others — and projects one view. Fielding to the 4th Inf. Div. is expected to be complete in December, Nabors said.

Modular Artillery Charge System

Armtec Defense Products (both)

"The Army's never had a rigid-case charge system before," said Jack Alt of Armtec Defense Products Co. It goes into production this year and will be fielded in 2001. "The casings completely disappear, so there's no residue in the gun barrel or chamber.'"

"Currently, the field artillery uses bag charges that come in various sizes," Alt said. Modular charges will come in one-size cans. "One system comprising two modules will replace four, reducing logistical requirements by about 25 percent."

Other Technologies Under Development

Communications-Electronics Command is also developing:

- **Situational awareness**

Developers are working to provide full situational awareness through heads-up computer displays that can provide battlefield images, among them those transmitted by unmanned aerial vehicles.

- **Telecommunications capability**

CECOM, with researchers at the RDEC's Night-Vision and Electronics Directorate at Fort Belvoir, is developing point-and-shoot technology that will allow an infantryman to point a laser at a target, eliminate it himself, have another infantryman eliminate it, or call in field artillery fire on it.

"What we're doing is giving the

CECOM

Improved Global-Positioning System

Improved position-location services are being fielded to soldiers in Kosovo, said COL Stanley Leja, deputy director of CECOM's Research, Development and Engineering Center at Fort Monmouth, N.J.

Also, 70 sets of commercial truck-tracking communication equipment were fielded in April to soldiers in Bosnia under the Bosnia Digitization Effort.

Using an antenna system mounted on a Humvee, a computer provides situational awareness, not only for soldiers, but for their leaders, as well.

soldier the same ability as aircraft crews have for laser designation of aircraft," Nabors said.

• Telemaintenance

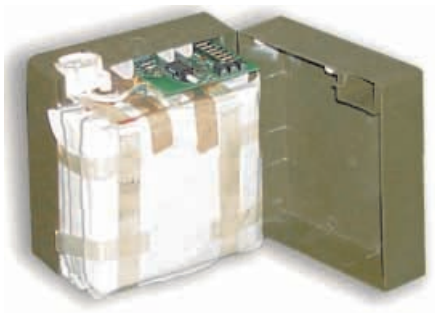
Much like telemedicine, it would link soldiers wearing textbook-size computers with experts who could look at electronic images of a particular piece of equipment and, in turn, download appropriate pages of repair manuals to soldiers in the field, Nabors said.

• Reach-back Communications

It could move data at very high speed around obstacles and send it to a larger staging base, eliminating problems soldiers now face in forward areas when mountains separate them, Nabors said.

• Lighter batteries for the Army's Land Warrior computerized ground-combat system.

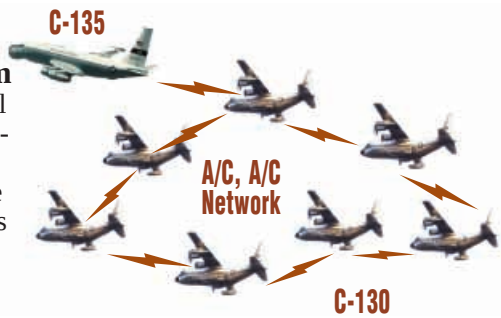
"We're making flexible batteries that are like paper," Nabors said. The batteries can be sliced with a knife, cut with scissors or penetrated by bullets and still provide power.



CECOM

• En Route Mission Planning and Rehearsal System

ERMPRS could give tactical commanders aboard different C-130 aircraft, flying hundreds of miles apart, time to refine battle plans by linking their computers so that every commander sees the same images on the screen.



Potential Technologies for Interim BCTs

Other exhibits at the AUSA symposium showcased some of the options currently under consideration for the Army's interim brigade combat teams.

Yossi Aviram, a representative of the Washington, D.C., office of the Israeli firm Rafael and former head of doctrine in the Israeli army, said: "The U.S. concept has always been that vehicles transporting soldiers to the battle had to have a fighting capability. Now, the idea is that soldiers don't need to fight in the vehicle, but on the ground."

The Israeli army has used "hardened" vehicles for years. "We're not promoting or producing the vehicle itself, but the survivability package of the vehicle, based on battlefield-proven technology," Aviram said.

• Reactive add-on armor

Already incorporated in some vehicles of both the U.S. and Israeli armies, reactive armor depends on the rapid release of energy within the armor plating to counter the impact of an incoming projectile. Composite ceramic armor is another option.

• Light-armored wheeled vehicles

Among those on display at the symposium was LAV-III. Currently being produced for the Canadian army by General Motors Defense Systems, LAV-III is among a number of vehicles the Army is considering as the interim combat brigade vehicle. The Canadians recently loaned some LAV-IIIs to I Corps at Fort Lewis, Wash. Soldiers from the Army's first two restructured brigades there are testing them.

Army officials hope to award a contract for the BCT vehicle some time late this summer.

General Motors Defense Systems

• Future Scout and Cavalry System

The joint American-British program will demonstrate future reconnaissance capabilities, potentially for use by the combat infantry brigades in 2008 to 2010.

"We're looking at a wide variety of different concepts now. The system we test, the integrated demonstrator — a form of prototype — that we hope to roll out in about 2002 will show the Army what's possible and manageable," said J.C. Hudson, a spokesman at Raytheon.

Among ideas for the innovative system is an advanced suite of sensors that will be able to identify enemy forces well beyond the range at which they can actually be engaged, Hudson said.

Future Warrior

Among the concepts the Army is considering for potential development and fielding in 2010 and beyond is Future Warrior.

USASSC (both)

SGT Joseph Patterson, from the Soldier Systems Center, looked a lot like Spiderman in black body-conforming fabric, wearing the potential combat uniform infantry soldiers might make use of in 2025.

"It's strictly a concept at this point," Patterson said. "We have a body scanner at Natick, and we talk about body scanning to create uniforms that are molded to the body."

Here's what Future Warrior could include:

• Electrospinning

A process that virtually spray paints fine fibers onto an exact pattern of the soldier's body could be involved, Patterson said. The clothing fibers naturally form semipermeable membranes that allow the suit to "breath." Additionally, it would provide protection against wind, rain, and chemical and biological agents.

USASSC

• Sensors

Located inside the clothing fibers, the sensors could automatically change a soldier's uniform to blend into the environment he's in, Patterson said. "And conductive textiles could allow us to communicate without having to wear any wires or cables."

Researchers from the Soldier System Center's Advanced Concepts Division said: "When fiber-optics are woven in, it can determine the damage done by a bullet, based on the color and amount of blood. The suit could then send data to medical units about what type of bullet penetrated the soldier's body."

• Heat-seeking, miniaturized, 15mm "smart" projectiles and kinetic-energy rounds

Fired from a soldier's arm, the projectiles could be contained in a five-round carrier for 30-meter kill capability. Additionally, 4.46mm kinetic energy rounds — 10 rounds in a tube — would be the close-quarters weapon of choice.

ARL Efforts

•Robotics

The Army Research Laboratory, the Army's leader for exploratory development in robotics, is working with the Defense Advanced Research Projects Agency to speed application of robotics to perform various functions on the battlefield, said ARL director Dr. Robert Whalin.

"In October we demonstrated a totally autonomous vehicle a little smaller than a Humvee. It traveled about 10 miles per hour over cross-country terrain, without tethers or human intervention," Whalin said. ARL plans to conduct another test

Other ARL technologies

• Stealth

The technology could be incorporated into ground vehicles, but with even lower signatures than the stealth bomber to avoid detection.

• Microturbines

They'd provide lighter-weight, longer-life power sources. "We're in the very early, basic research stages," said Whalin. "We're probably 10 years away from a product, but it's a promising approach to reduce the logistics tail that's a big part of the Army restructuring effort."

The one-inch turbines fit in a container the size of a soda can to generate power.

Clearly, the Army is doing much more than talking about change. Restructuring is already taking place. And as new technologies find their way into the hands of soldiers, the Army will ease its way closer and closer to the objective force of the future.

Dave Choat

this October, pushing the robotic vehicle to 20 mph.

"We believe robotics will play an important role on the battlefield in the next 10 to 15 years, in such systems as robotic-controlled ammunition carriers, communications vehicles and robotic scouts," Whalin said.

He said ARL would work with the Tank-Automotive and Armaments Command's engineering center to develop robotic vehicle technologies.

ARL will also participate in an academic alliance in robotics technology development in fiscal year 2001, with funding support of some $10 million, Whalin said. ARL funds its academic research through its Army Research Office in North Carolina. "Basic research is being realigned to focus on key aspects of the Army vision.

"There's also an urgent emphasis on armor," Whalin said, "not so much reactive armor, which already exists, as lighter-weight ceramic armor and newer materials." The development of sensor technology and related mechanics that can "sense" a threat and intervene before the soldier's vehicle is hit is another ARL priority.

• Warrior Extended Battlespace sensors, WEB

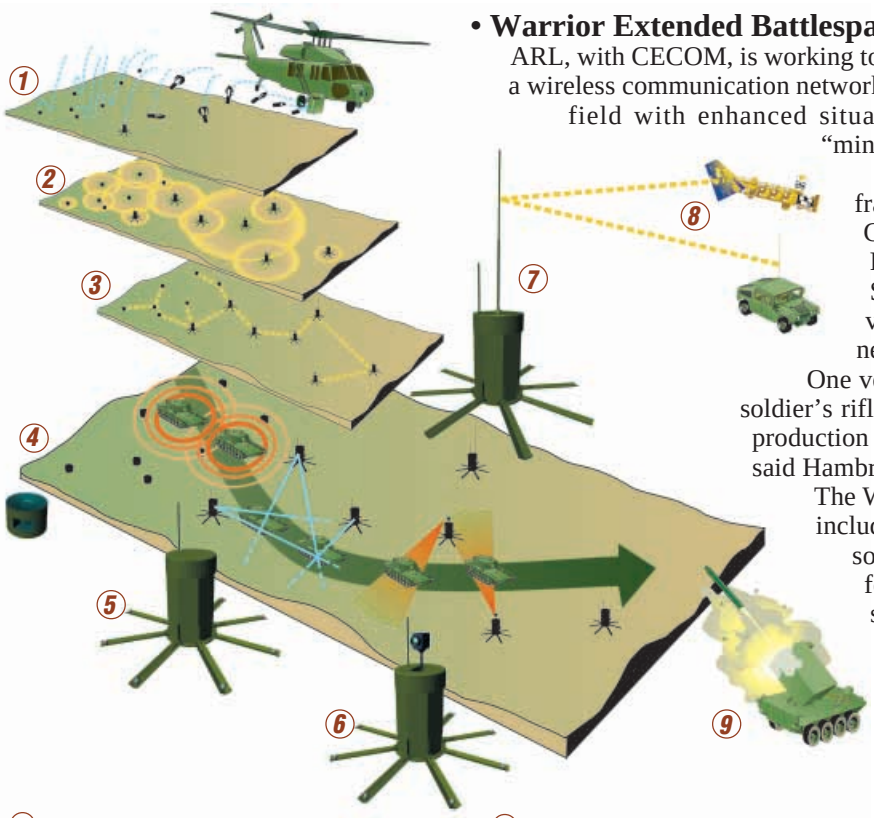
ARL, with CECOM, is working to develop miniature battlefield sensors to create a wireless communication network that will provide forces throughout the battlefield with enhanced situational awareness and early detection — a "minefield" without mines.

CECOM is developing the world's smallest infrared camera, the UL3, said Hap Hambric, CECOM RDEC's special projects officer, from the Fort Belvoir-based Night Vision-Electronic Sensors Directorate. The ultra low-power, low-volume and light-weight camera includes a magnetic-acoustic-seismic sensor developed by ARL. One version of the camera, designed for use with the soldier's rifle in the LW system, is currently in the limited production phase. "It's a building block toward the UL3," said Hambric.

The WEB, as currently envisioned by the Army, will include an undetermined number and variety of sensors, radios and cameras, depending on terrain features, said ARL spokesman Scott Miller. The sensors can be dispensed over a wide area by artillery fire or placed by hand.

Because the sensors are not explosives, they can replace small antipersonnel land mines that often kill and maim innocent civilians, Miller said.

Richard Hasenauer



(1) Hosts of microsensors are dispersed by special forces, helicopters or other artillery, deep over enemy deployments and also on likely approach routes.

(2) Deployed microsensors emit neighbor discovery signals to locate the scattered sensor nodes.

(3) Microsensors self-organize, with the most logical and efficient nodes as routers, to form a local ad hoc network.

(4) Low-energy acoustic sensors provide early warning detection and sensor cueing.

(5) Acoustic, seismic and magnetic multi-sensor arrays are cued to collectively locate and classify potential targets.

(6) More sophisticated sensors, using electro-optics and infrared, can also be cued for further target identification.

(7) Target data is efficiently routed from network sensor nodes to a local gateway device with the processing power to determine the relevance of the data.

(8) With long-haul comm links through satellite or terrestrial-based wireless communications, the gateway transmits only crucial military intelligence to the commander.

(9) Precision munitions are launched against the enemy force as the microsensor network continues to monitor this extended-range engagement for battle damage assessment and retargeting.